

Digging into Exposure Disparities: Mapping Lead Service Lines in New York City

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Nine years after the Flint, Michigan, water crisis raised public awareness about lead in drinking water,¹ it is still unclear how much lead remains in the U.S. water infrastructure. This is especially true of the service lines that connect water mains to individual homes or buildings, says Annie Nigra, an environmental health scientist at Columbia University's Mailman School of Public Health. In New York City, where mains crisscross the five boroughs to bring water to its 8.3 million residents, not all lead service lines have even been mapped, much less replaced, according to Nigra.

A vast database of local plumbing infrastructure maintained by the city's Department of Environmental Protection classifies each service line as either *Potential Lead*, *Unknown*, *Not Lead*, or *Not Applicable*, based on records filed by licensed plumbers.² In a study published recently in *Environmental Health Perspectives*,³ Nigra and her colleagues used these data — along with geographic information system maps of water service lines, demographic data from 2,083 census tracts in the city, and building age and use figures — to identify racial characteristics of neighborhoods that were likely to have lead service lines. Their work involved the

portion of the city's 854,672 residential service lines that were classified as either *Potential Lead* (16.0%) or *Unknown* (26.6%).

Using mathematical models to estimate how service line composition varied by census tract, Nigra and her team estimated that, citywide, areas with higher Hispanic/Latino populations were 15% more likely to have lead service lines than majority non-Hispanic White neighborhoods. What's more, children living in neighborhoods with a high risk of lead service lines were also identified by the modeling as being socially vulnerable and at higher risk for elevated blood lead levels from paint and other sources. Social vulnerability measures incorporated criteria such as the proportion of residents who received Supplemental Nutrition Assistance Program benefits, lived below a certain income level, or were adults without a high school diploma.

Importantly, the results varied by borough. In the Bronx and Manhattan, potential lead service lines were associated with neighborhoods that had more non-Hispanic White and non-Hispanic Asian residents. In Queens, majority Black neighborhoods were the most likely to have potential lead service lines.



Workmen prepare to replace old water pipes with new copper line in Newark, New Jersey. Image: © Associated Press.

The 2021 Infrastructure Investment and Jobs Act allocated USD \$50 billion to the U.S. Environmental Protection Agency for multiple improvements to drinking water structure, of which USD \$15 billion is earmarked for replacing lead pipes.⁴ It sounds like a lot of money, Nigra acknowledges, but the American Water Works Association estimates that replacing all of the nation's lead service lines would cost at least USD \$60 billion.⁵ As localities prioritize lead line replacement and other forms of environmental justice, Nigra says it is important to focus on neighborhoods that are most likely to benefit, such as those revealed in her study.

"Public health professionals need to make data-driven decisions," says Brian Weaver, the lead poisoning prevention initiatives advisor at Wisconsin's Department of Health Services. "It makes sense to allocate resources where we know that environmental factors put a family at risk for lead poisoning." Research consistently shows that children living in low-income and historically marginalized communities are disproportionately likely to have high blood lead levels.⁶ When Weaver and his team mapped⁷ elevated childhood lead levels in census tracts across Wisconsin, they reported that areas with the highest proportion of children with blood lead levels over 5 µg/dL were concentrated in older, less-affluent urban neighborhoods.

"Like most environmental exposures, certain communities are disproportionately impacted by lead," says Marissa Hauptman, codirector for the Pediatric Environmental Health Center at Boston Children's Hospital. "It's important to invest in mitigating any sources of lead in these communities."

Nigra agrees. "Even small amounts of lead in water can be dangerous for young children," she says. "Replacing these lines will be very expensive, and it will take a very long time. But that is an environmentally just future that we should all be looking for."

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References

1. Masten SJ, Davies SH, McElmurry SP. 2016. Flint water crisis: what happened and why? *J Am Water Works Assoc* 108(12):22–34, PMID: 28316336, <https://doi.org/10.5942/jawwa.2016.108.0195>.
2. New York City Department of Environmental Protection. 2021. Lead Service Line Location Coordinates. <https://data.cityofnewyork.us/Environment/Lead-Service-Line-Location-Coordinates/bnkq-6un4> [accessed 6 September 2023].
3. Nigra AE, Lieberman-Cribbin W, Bostick BC, Chillrud SN, Carrión D. 2023. Geospatial assessment of racial/ethnic composition, social vulnerability, and lead water service lines in New York City. *Environ Health Perspect* 131(8):87015, PMID: 37646509, <https://doi.org/10.1289/EHP12276>.
4. U.S. Environmental Protection Agency. 2023. Water Infrastructure Investments. <https://www.epa.gov/infrastructure/water-infrastructure-investments> [accessed 6 September 2023].
5. American Water Works Association. 2021. AWWA Statement on release of American Jobs Plan. <https://www.awwa.org/AWWA-Articles/awwa-statement-on-release-of-american-jobs-plan> [accessed 6 September 2023].
6. Benfer EA. 2017. Contaminated childhood: how the United States failed to prevent the chronic lead poisoning of low-income children and communities of color. *HELR Harvard Environ Law Rev* 41:493–561. Available: https://journals.law.harvard.edu/elr/wp-content/uploads/sites/79/2017/08/Benfer_final.pdf [accessed 6 September 2023].
7. Wisconsin Department of Health Services. 2023. Childhood Lead Poisoning Data Explorer. <https://dhsgis.wi.gov/dhs/clpde/> [accessed 6 September 2023].